Carotid artery–sparing repair of a cavernous carotid artery pseudoaneurysm

Case illustration

PETER KAN, M.D., EDWIN A. STEVENS, M.D., RICHARD R. ORLANDI, M.D., AND WILLIAM T. COULDWELL, M.D., PH.D.

Departments of Neurosurgery, Otolaryngology, and Radiology, University of Utah School of Medicine, Salt Lake City, Utah

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Carotid artery (CA) injury after transsphenoidal and endoscopic sinus surgery is a well-recognized but fortunately rare complication.[1] It is associated with significant morbidity and mortality rates[5] and is more common in cases of repeated surgery, cavernous sinus invasion, prior radiotherapy, and anatomical anomalies of the sphenoid and cavernous sinuses.[4] It usually results in CA stenosis, occlusion, or pseudoaneurysm formation followed by serious complications, such as stroke and caroticocavernous fistulas.[5] Direct surgical repair is difficult, and treatment may require parent vessel sacrifice and possibly vascular bypass.[5] We describe the successful treatment of a cavernous–CA pseudoaneurysm with a novel CA-sparing approach.

This 62-year-old woman with recurrent esthesioneuroblastoma underwent endoscopic tumor resection. A CA injury occurred intraoperatively. Hemostasis was rapidly achieved by packing the bleeding site with cottonoid and packing strip gauze within the sphenoid sinus. Postoperative angiography performed immediately after surgery revealed a 2-mm pseudoaneurysm at the anterior genu of the left cavernous internal CA (ICA) with minimal stenosis (Fig. 1 *left*). Eight days after the initial arterial injury, repeat angiography demonstrated persistence of the aneurysm. To repair the arterial defect and preserve the CA, an endovascular stent was placed across the puncture site to restore its normal caliber and to provide a buttressing surface for surgical repair by graft apposition (Fig. 1 *right*). Subsequently, with the aid of the operating microscope, a small piece of autologous fascia lata graft was placed directly over the arterial puncture site via a transnasal–transsphenoidal approach and bound using BioGlue (CryoLife, Inc., Kennesaw, GA), a two-component (bovine serum albumin and glutaraldehyde) surgical adhesive that is used as an adjunct to open surgical repair of large vessels, such as the aorta, femoral artery, and CA.[2] The fascia lata graft was placed over the puncture site to patch the hole in the arterial wall directly because the pseudoaneurysm remained and was unchanged after stent placement alone, presumably because of the interstices of the stent. The sphenoid sinus was packed with fat bolstered by nasal packs. Angiography 3 months after the initial injury demonstrated a normal left ICA and resolution of the pseudoaneurysm (Fig. 2).

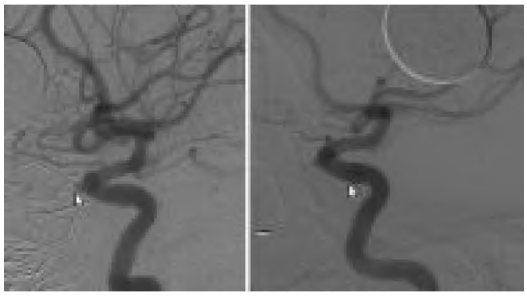

FIG. 1. *Left:* Lateral left ICA angiogram revealing a 2-mm pseudoaneurysm *(arrow)* at the anterior genu of the left cavernous ICA. *Right:* Lateral left ICA angiogram demonstrating a Neuroform stent *(arrow)* placed within the left cavernous ICA spanning the pseudoaneurysm.

FIG. 2. Lateral left ICA angiogram obtained 3 months after the initial injury, showing complete resolution of the pseudoaneurysm *(arrow)*.

Many surgical and endovascular strategies have been reported in the treatment of pseudoaneurysms due to CA injury after transsphenoidal and endoscopic surgery.[3–5] Our simple multimodal approach offers the advantage of sparing the parent CA while maintaining its normal caliber when endovascular embolization cannot be performed because of a lack of supporting tissue to contain the coils or balloons.

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References

1. Ciric I, Ragin A, Baumgartner C, Pierce D: Complications of transsphenoidal surgery: results of a national survey, review of the literature, and personal experience. **Neurosurgery 40:** 225–237, 1997
2. Coselli JS, Bavaria JE, Fehrenbacher J, Stowe CL, Macheers SK, Gundry SR: Prospective randomized study of a protein-based tissue adhesive used as a hemostatic and structural adjunct in cardiac and vascular anastomotic repair procedures. **J Am Coll Surg 197:**243–252, 2003
3. Fukushima T, Maroon JC: Repair of carotid artery perforations during transsphenoidal surgery. **Surg Neurol 50:**174–177, 1998
4. Kadyrov NA, Friedman JA, Nichols DA, Cohen-Gadol AA, Link MJ, Piepgras DG: Endovascular treatment of an internal carotid artery pseudoaneurysm following transsphenoidal surgery. Case report. **J Neurosurg 96:**624–627, 2002
5. Raymond J, Hardy J, Czepko R, Roy D: Arterial injuries in transsphenoidal surgery for pituitary adenoma; the role of angiography and endovascular treatment. **AJNR Am J Neuroradiol 18:**655–665, 1997

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Address reprint requests to: William T. Couldwell, M.D., Ph.D., Department of Neurosurgery, University of Utah, 30 North 1900 East, Suite 3B409, Salt Lake City, Utah 84132, email: william.couldwell@hsc.utah.edu.